



Armed Forces College of Medicine

AFCM



Viral GIT infections

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INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

1. Outline the structure of viruses causing GIT infections.
2. Describe pathogenesis & clinical presentation of viral GIT infections.
3. Outline laboratory diagnosis of viral GIT infections.
4. Outline prevention of viral GIT infections.



Viral Infections of GIT

I-Infection of salivary glands

Mumps virus

II-Diarrhea

1. Rotaviruses

2. Norwalkviruses

3. Astroviruses

4. Adenoviruses

5. Coronaviruses

III-Hepatitis

Hepatitis viruses

COMMON CAUSES OF DIARRHEA- VIRUS

- ✓ *Rotavirus*
- ✓ *Human caliciviruses:* Norovirus spp.; Sapovirus spp.
- ✓ *Enteric adenoviruses*
- ✓ *Astroviruses,*
- ✓ *Coronaviruses,*

Mumps Virus

Structure

A - Family : Paramyxoviruses

B- Nucleocapsid

1-SS RNA

2-Helical

3- Nucleocapsid protein : S (soluble)Ag

C- Envelope : with 2 surface glycoproteins:

1-Bifunctional protein : Haemagglutinin-neuraminidase

a.**Haemagglutinin** : **attaching** the virus to host-cell receptors(early)

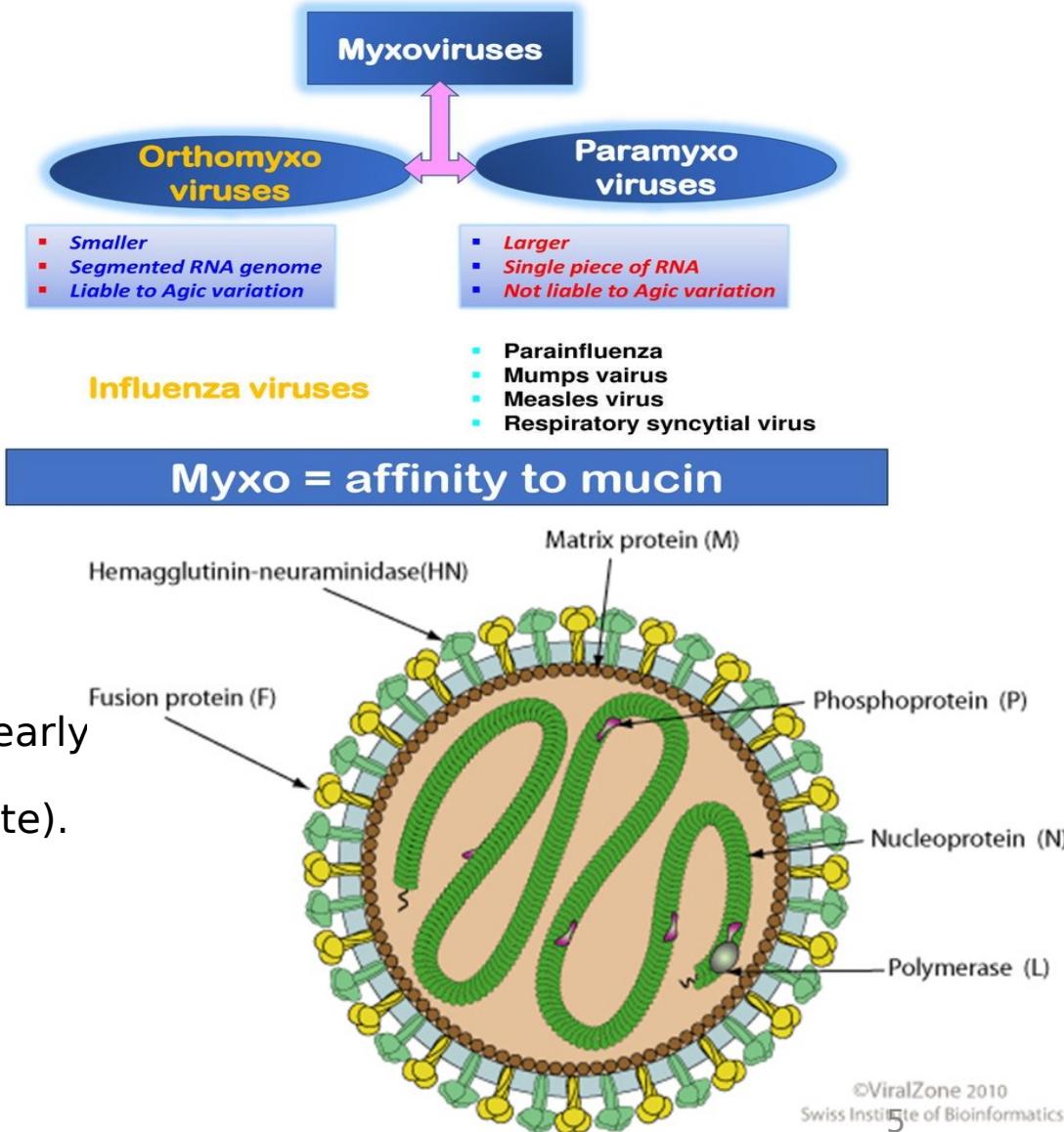
b.**Neuraminidase** : **releasing** new virions from infected cells(late).

2-Fusion protein

Fusing envelope with the host cell membrane

D-The virus has a single stable serotype

GIT module

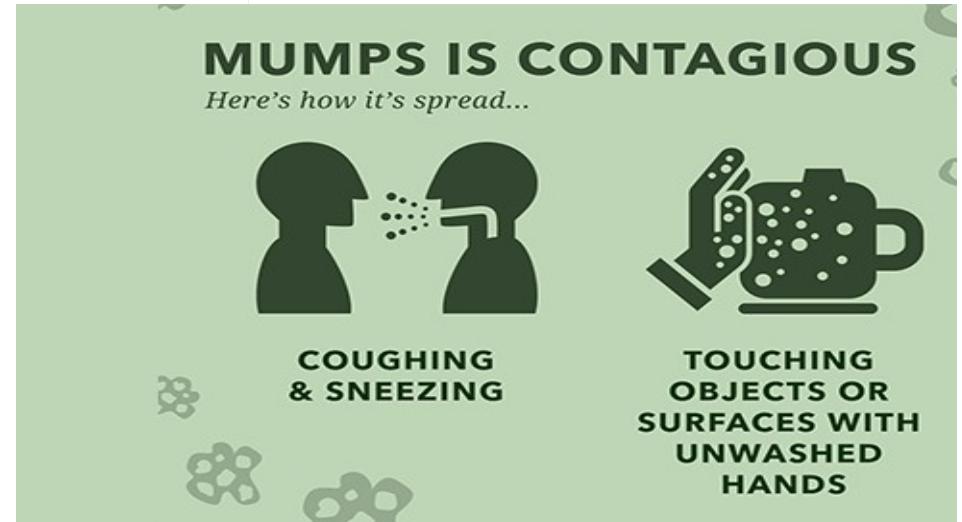




Mumps Virus

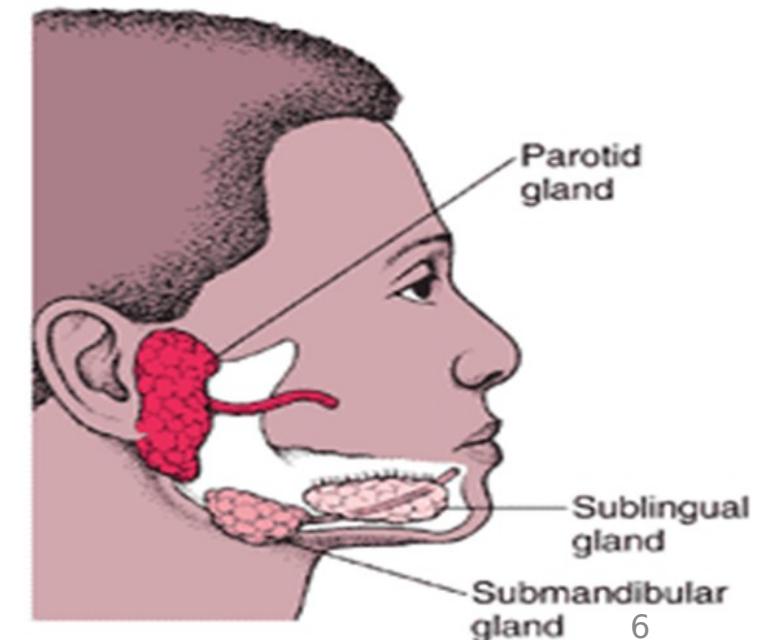
Pathogenesis

A-Source & mode of transmission



B-Infectivity

- Mumps is very contagious



Mumps Virus

C- Replication

1-1ry replication & Spread

In upper RT & LNs in neck

Viremia

Dissemination to :

a. Glandular tissues

Salivary glands, testes, ovaries, pancreas & kidney

b. Meninges

OR

Virus may **ascend** from the buccal mucosa

Stensen's duct

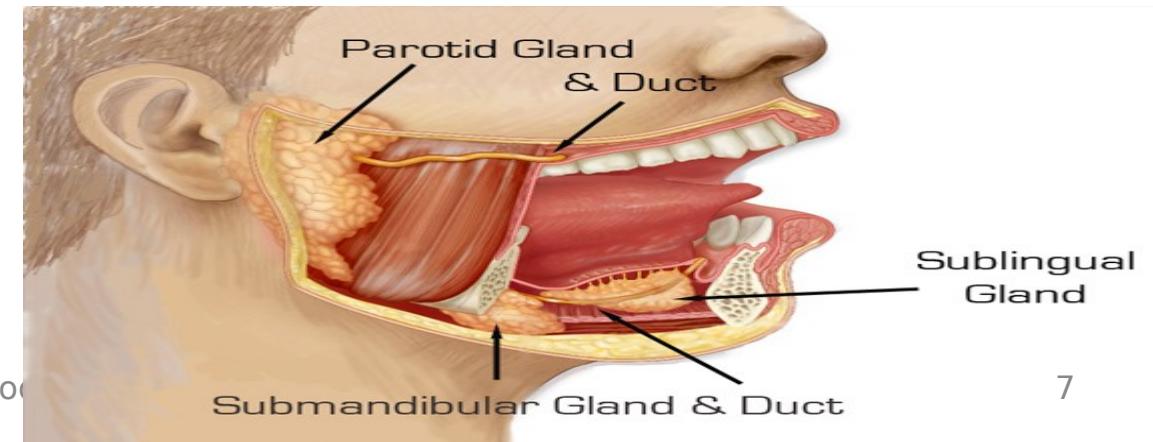
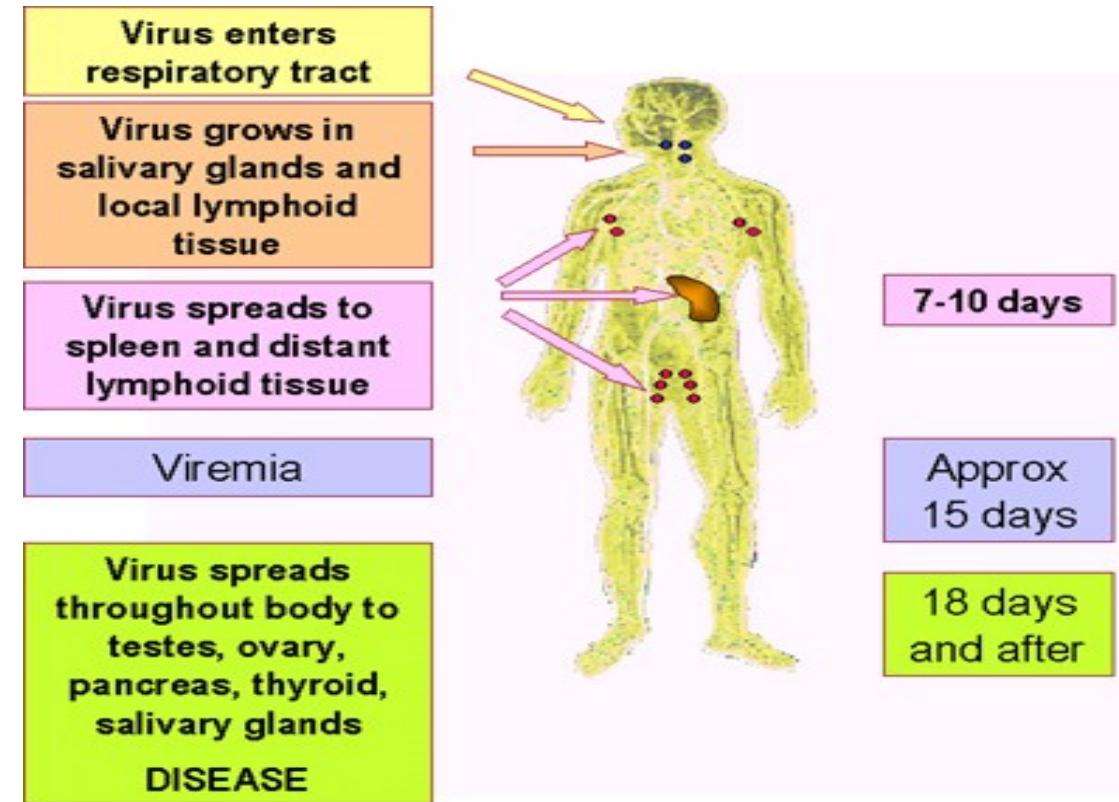
parotid gland

2-Site of virus

a. Blood & saliva : for 3-5 days after onset of disease

b. Urine : after 10 days

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GIT mod





Mumps Virus

D-Immunity

- Neutralizing Abs are produced **against hemagglutin**

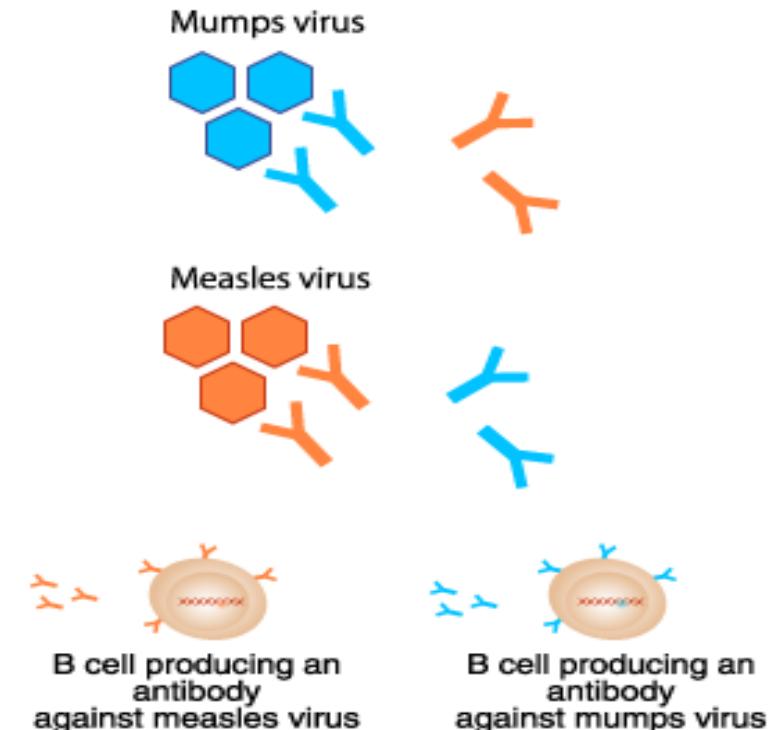


Life long immunity

- Maternal IgG crosses the placenta



Protection during **1st 6 months** of life



Clinical manifestations

Mumps : epidemic non-suppurative parotitis

A - Asymptomatic infections are common

B - Fever

C -Painful swelling & inflammation of one or both parotid glands

(other salivary glands may be affected)

D - Complications

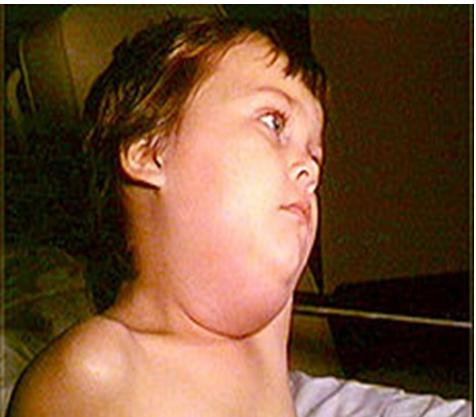
1-Aseptic meningitis

2-Postpubertal orchitis (Unilateral or bilateral)

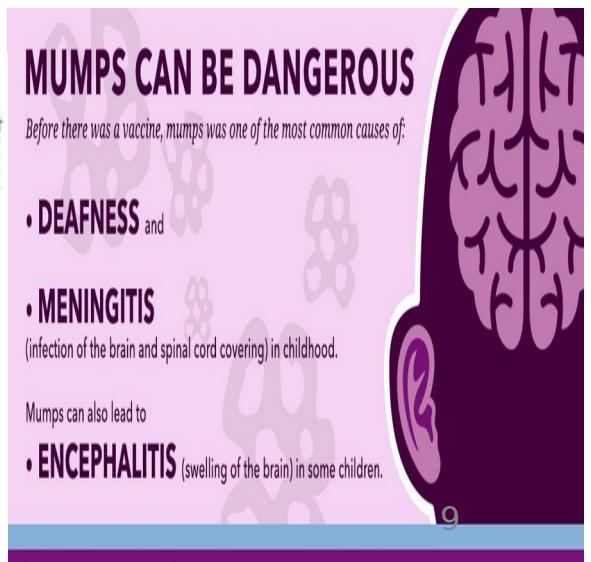
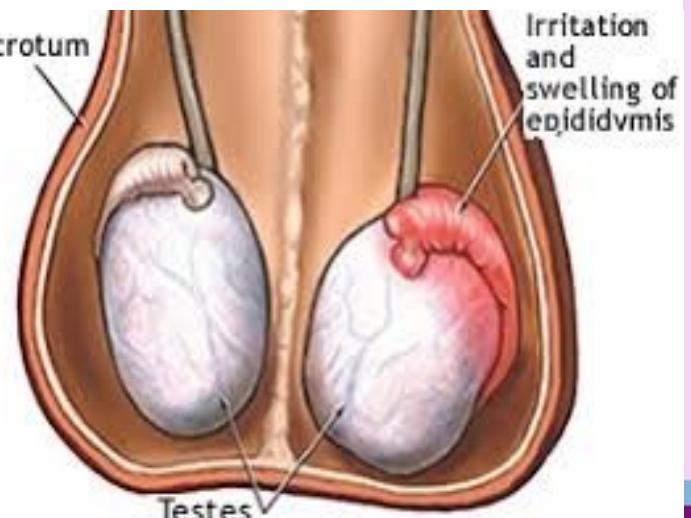
May lead to **sterility** if bilateral

3-Oophritis

4-Pancreatitis



SYMPTOMS OF MUMPS



Mumps virus

Laboratory diagnosis

to differentiate between mumps and **other infectious (bacterial)**

non infectious causes (tumors, stones) of parotid enlargement

Specimen : Saliva,CSF & urine

1-RT-PCR

Detection of viral RNA

2-Virus Isolation

On tissue culture

3-Serology

a-Detection of **IgM or rising titer of IgG against S Ag**

b-Detection of **S Ag**

Laboratory Diagnosis

- **No Laboratory confirmation needed.**
- Atypical infection needs laboratory Diagnosis.
- Virus isolated from

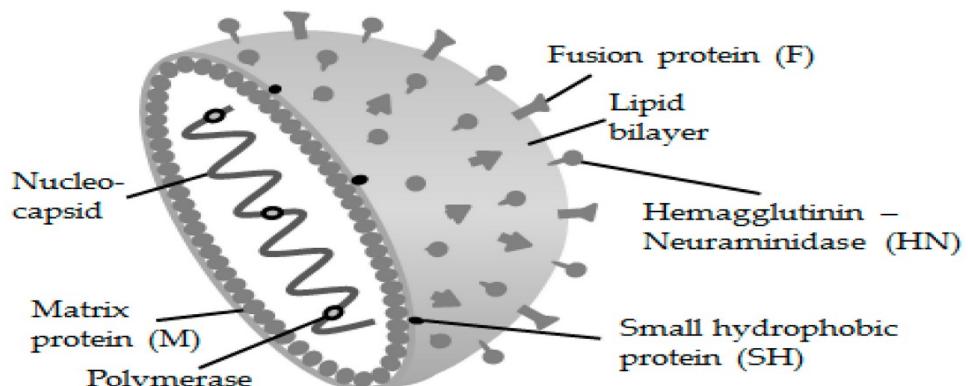
Saliva

Urine

CSF.

Culturing in **Human amnion, He la cells.**

- **Detection of mumps RNA** → by PCR
- **Serologic testing**
 - positive IgM antibody
 - significant increase in IgG antibody between acute and convalescent specimens





Mumps virus

Prevention

Age	Vaccines
12 months	MMR -1
4 years	MMR -2

It should not be given to immunocompromised persons or pregnant women.

Measles Mumps Rubella (MMR

vaccine):

is a live attenuated vaccine grown in chick embryo



Lecture Quiz



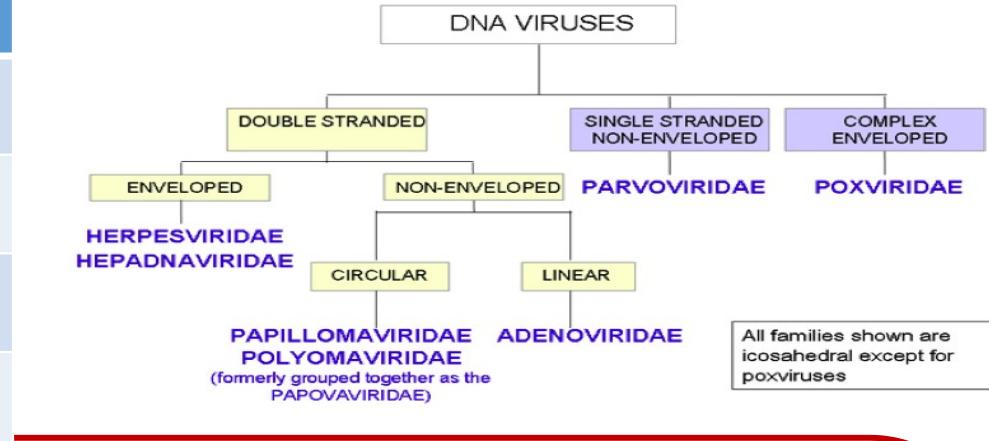
Question 1:

What is the mode of transmission of Mumps virus?

- a. Airborne
- b. Droplet
- c. Blood
- d. Sexual
- e. Feco-oral

Viral causes of gastroenteritis

	Acute watery (non-inflammatory) diarrhea
A - Cells in stools	No RBCs or WBCs i.e no inflammation
B - Fever	Afebrile
C - Volume	Large volume diarrhea
D - Site of inf.	Small intestine



E-Causative viruses

1- Rotavirus:

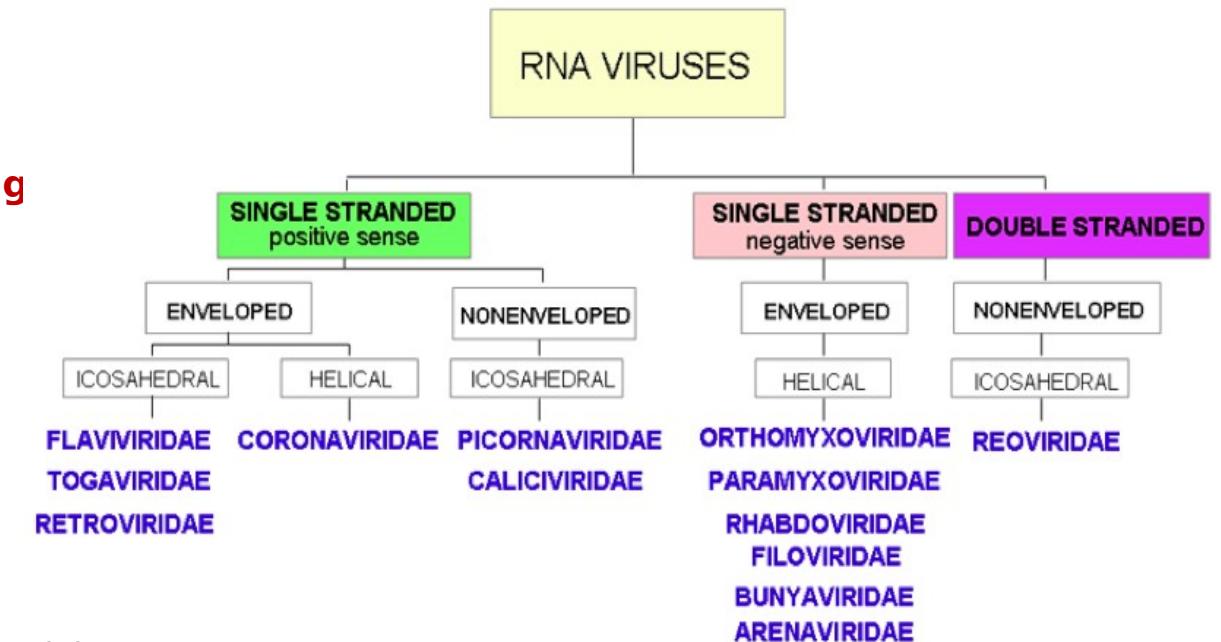
the most common cause of viral gastroenteritis in young

2- Norwalkviruses

3- Astroviruses

4- Adenoviruses type 40&41

5-Coronaviruses



Rotavirus

Structure

A- Family : **REO (respiratory enteric orphan) vi**

B-Nucleocapsid

1- Segmented ds RNA : 11 segments

2-Icosahedral

3-Double-layered protein coat

Wheel shape appearance under EM .(hence the name)

4- Type-specific Ag : Outer surface protein

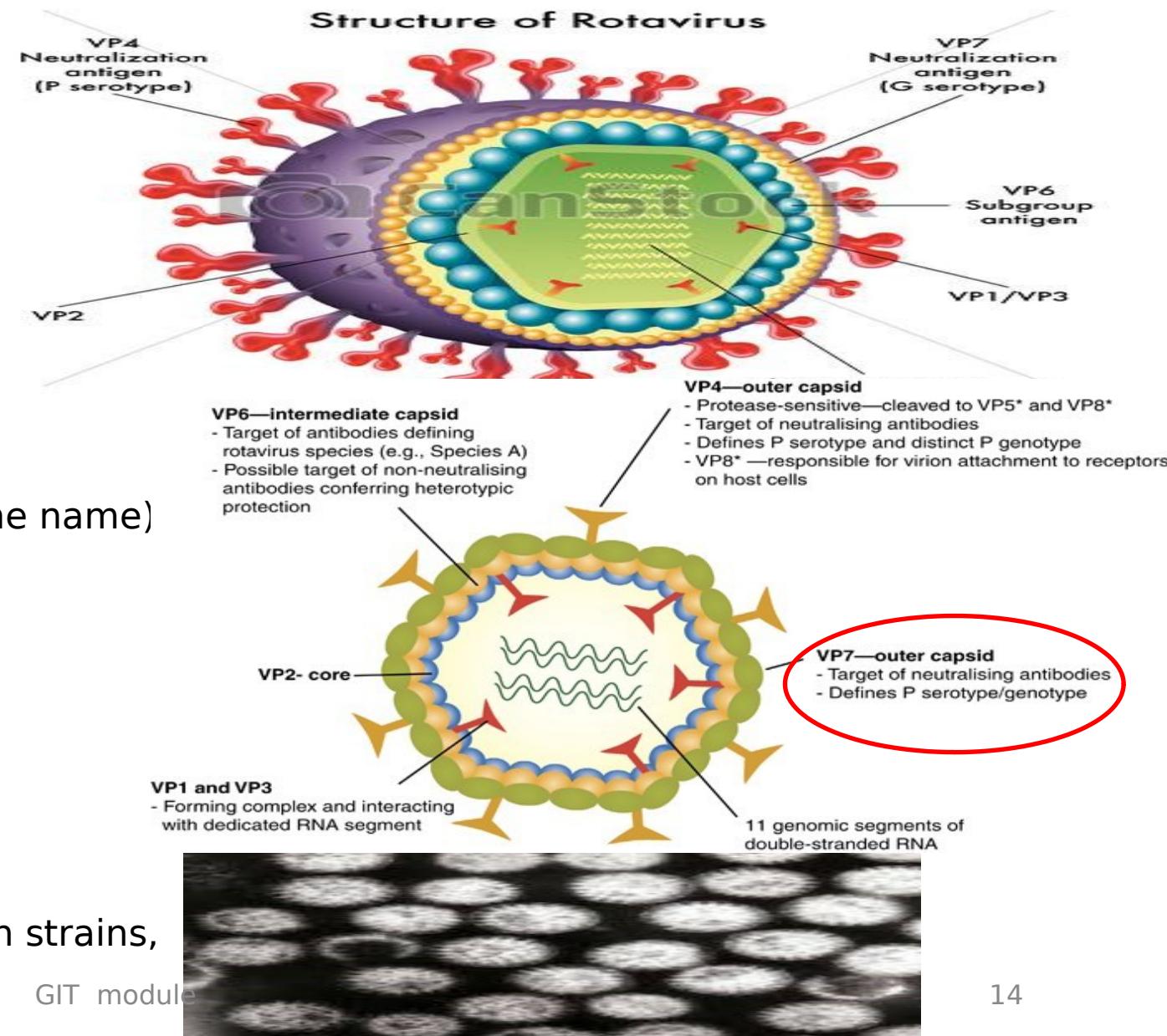
Target of neutralizing Abs

C-Non enveloped.

D-Animal strains

Many domestic animals are infected with their own strains,

but **aren't a source of human disease**



Rotavirus

Pathogenesis

A - Mode of transmission : Ingestion

④ **Feco oral:** Ingestion of contaminated food or H₂O

④ **Contact** with contaminated surfaces

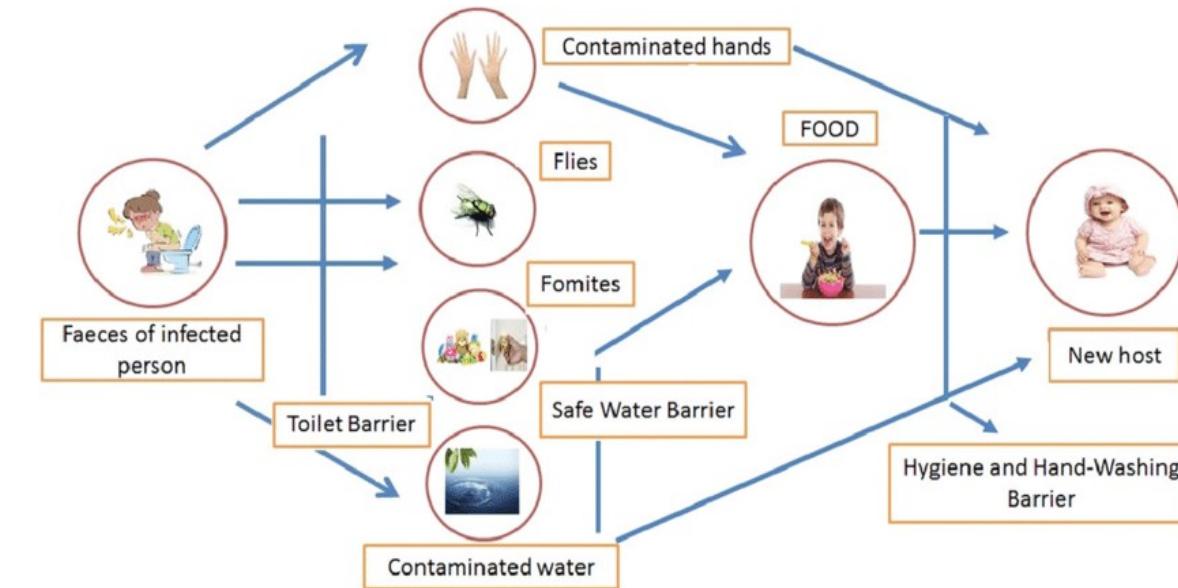
④ **Nosocomial infection**

B - Symptomatic infections

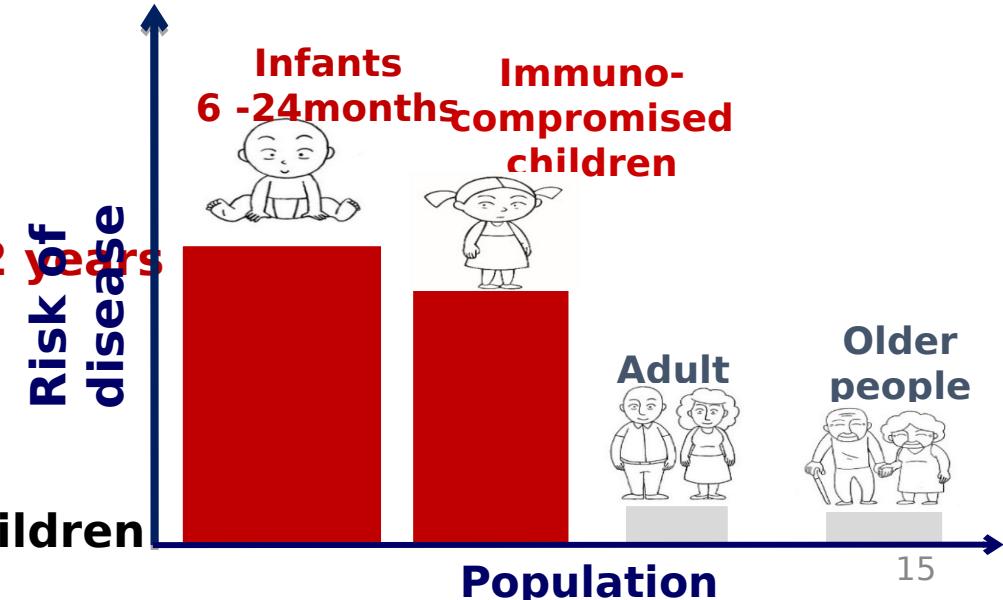
- **Most common in children between 6 months and 2 years**

- **Asymptomatic** in older children & adults

- May cause disease in **older immunocompromised children**



Outbreaks in daycare centers



Rotavirus

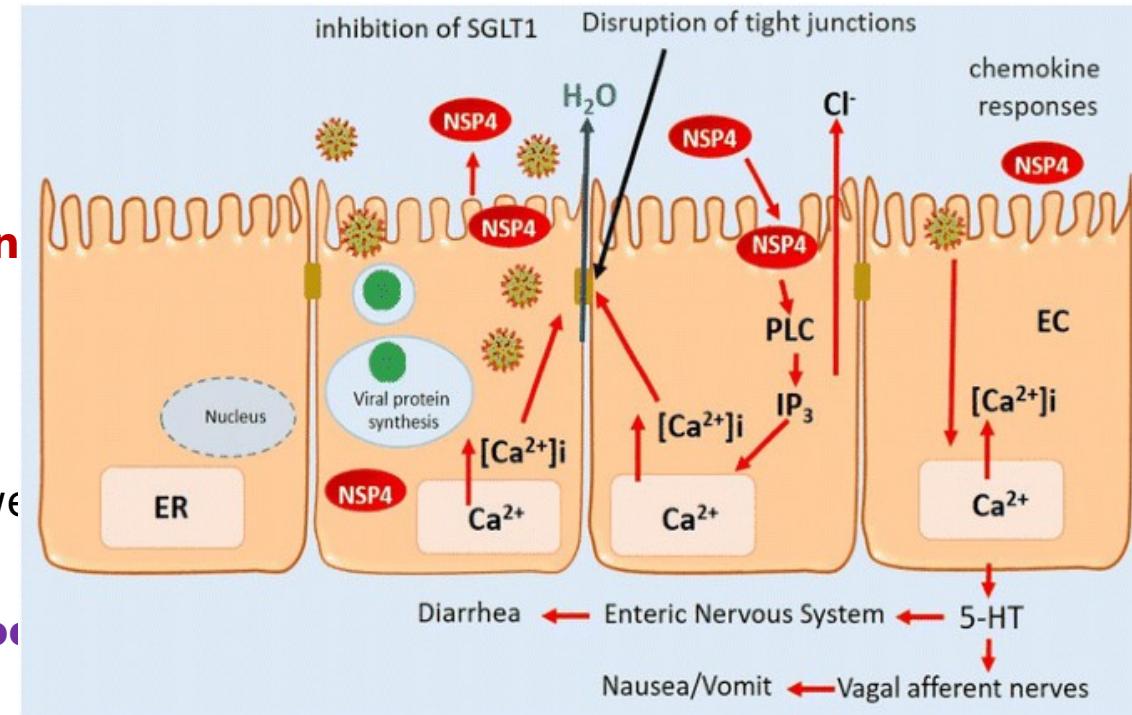
C - Replication & Effect on cells

1-Virus attaches to the cell surface at the site of β adren

Replicates in the mucosal cells of **the small intestine**,

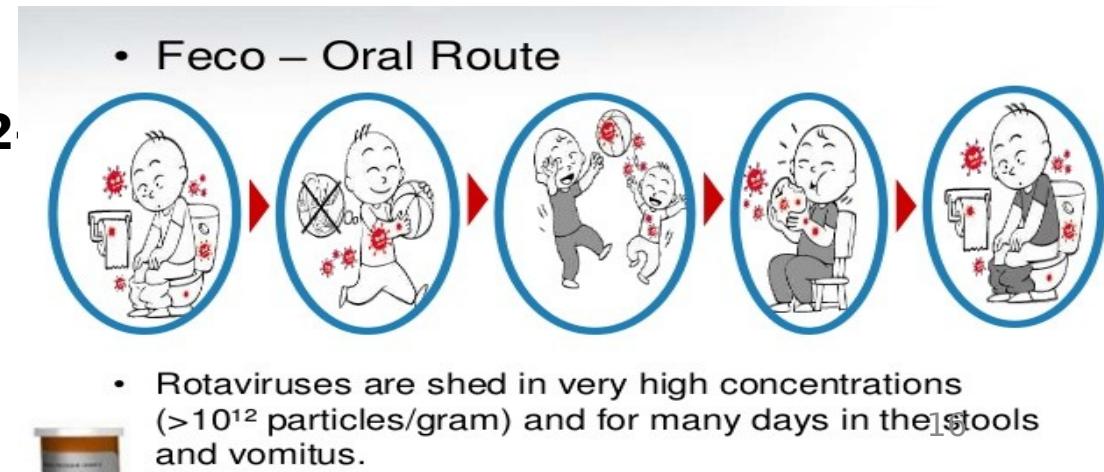
Excess secretion of fluids and electrolytes into the bowel

No inflammation occurs, and the diarrhea is non bloody



2-Virus is excreted in large amounts in stools for 2 weeks

(prolonged in immunocompromised patients)



Rotavirus

D-Immunity

④ Short lived immunity →

Reinfections are common

as it is mainly due to interferonα & secretory

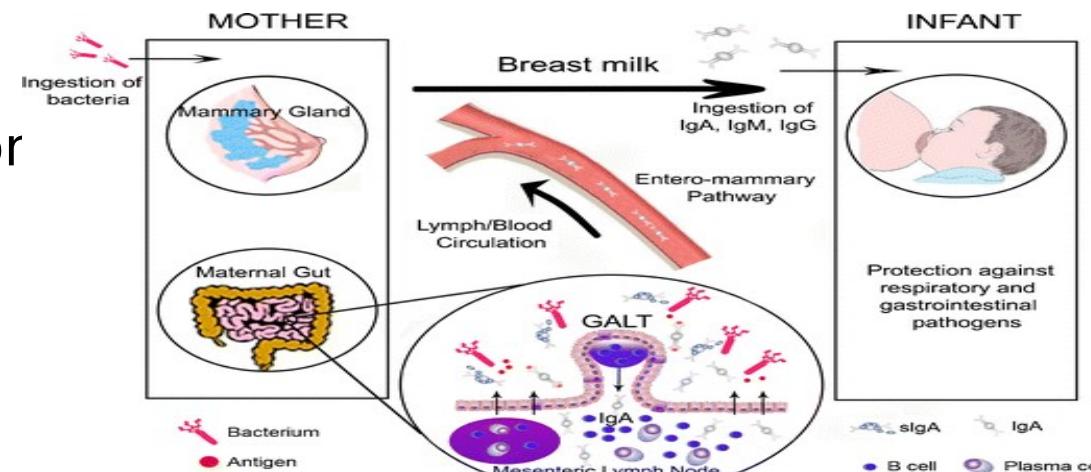
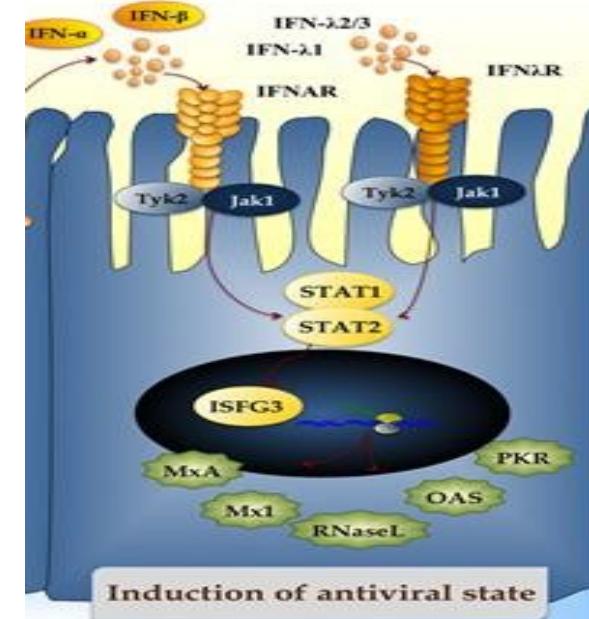
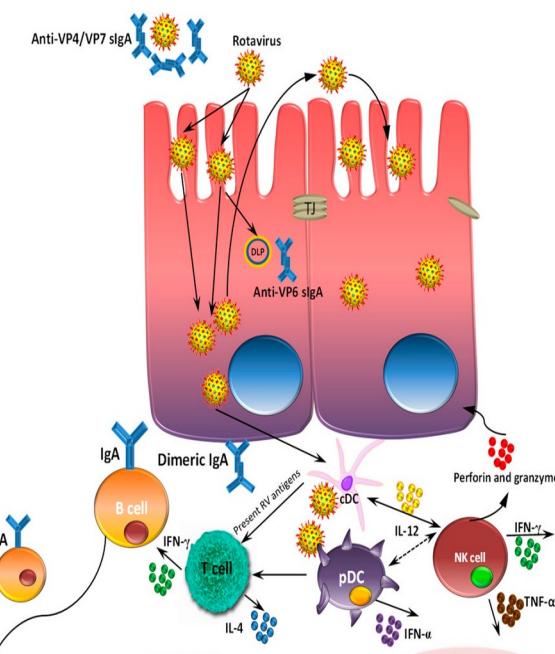
rather than IgG

④ Maternal sIgA in breast milk protect infant in 1st 6 months

④ By the age of 6 years, most children have Abs

to at least one serotype

GIT module



Rotavirus



Clinical manifestations

Most common cause of infantile gastroenteritis

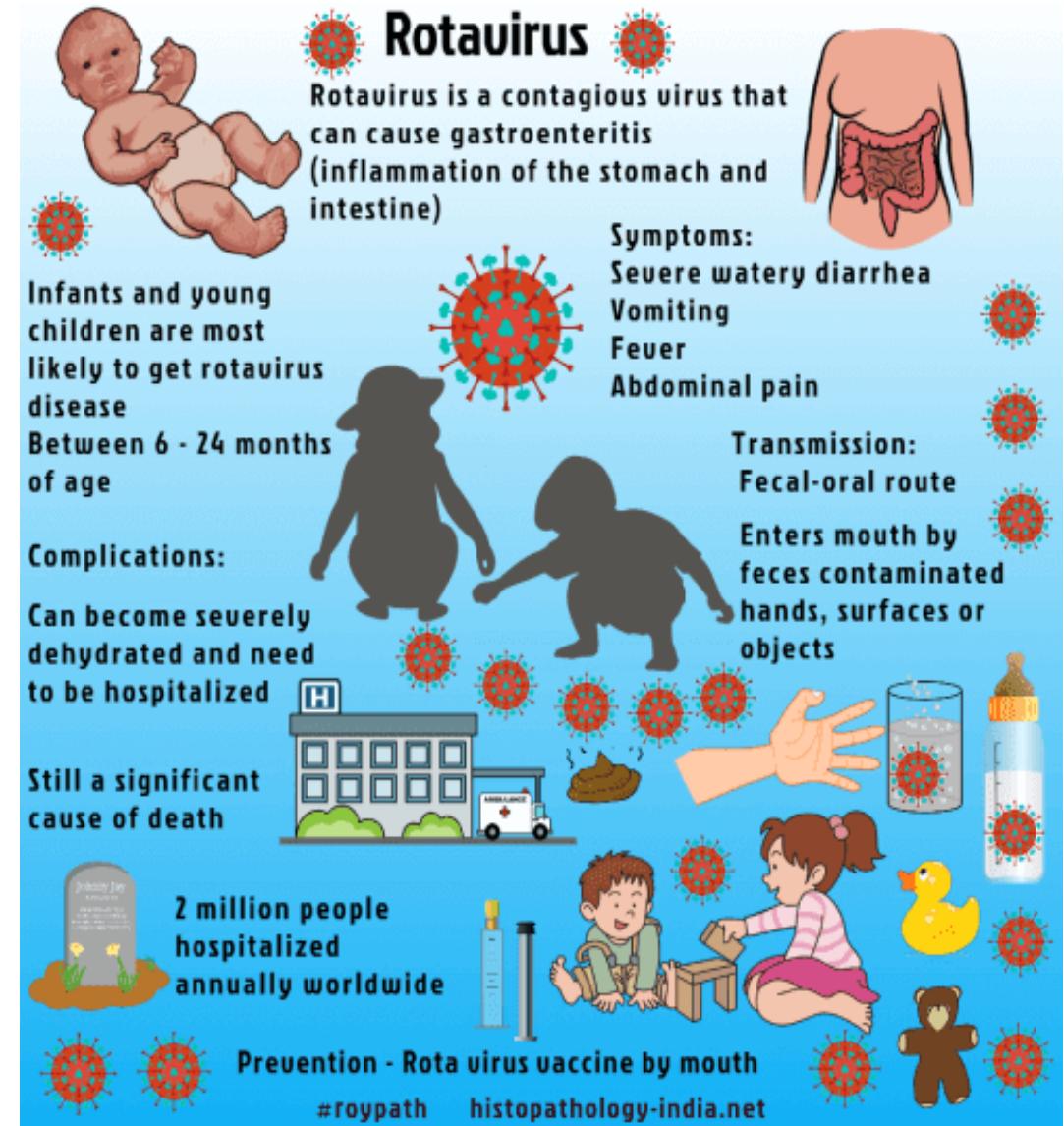
A -Three main symptoms of rotavirus infection:

- Abdominal pain
- Vomiting
- **Severe watery diarrhea**

B - Complications

Dehydration & electrolyte imbalance
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GIT module



Rotavirus

Laboratory diagnosis

A- Lab Protocol

All stool or diarrheal fluid samples from children suffering from gastroenteritis should be tested for Rota virus infection

by ELISA rapid test for Ag detection

NB At the peak of infection ,as many as 10^{11} viral particles/nl of stool are present

B- Demonstration of wheel-shaped virus : by EM

C-Serology : ELISA

Rising Ab titer of IgG



Rotavirus

Prevention

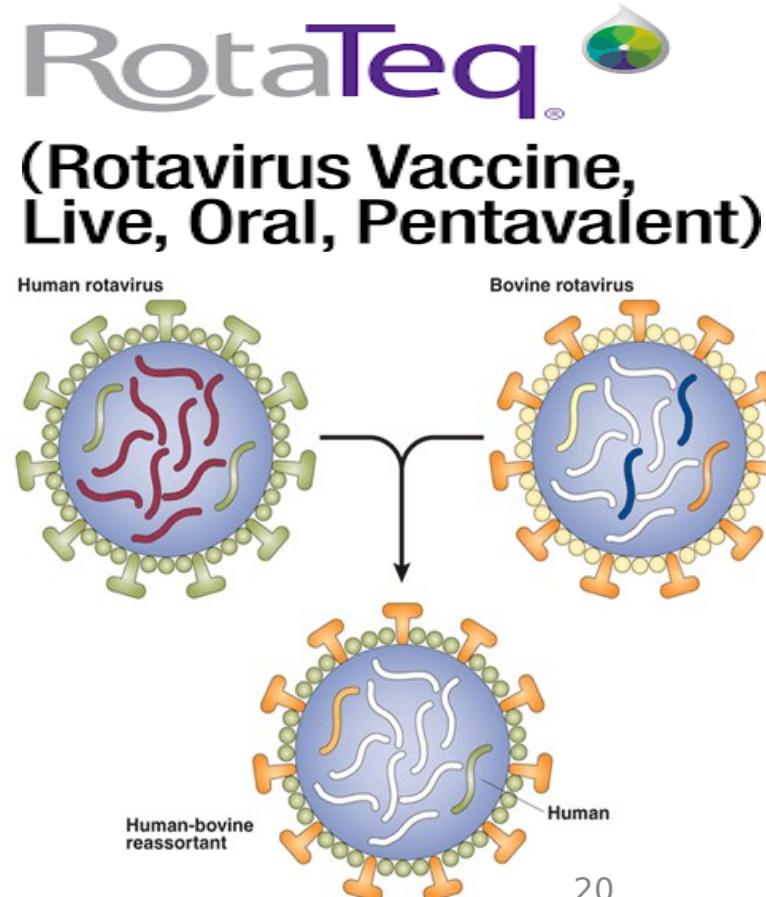
A-Preparation

2 rotavirus live attenuated oral vaccines → given during early infant life



B-Types

Monovalent human vaccine (Rotarix)	Pentavalent human-bovine reassortant vaccine (Rotateq)
Contains the single most common rotavirus serotype causing disease	Gene for outer surface protein of human strains is inserted into bovine strain (non pathogenic to human) Protective secretory IgA in GIT against the protein



Lecture Quiz



Question 2:

Rota virus should be screened in stool samples in which of the following groups?

- A. Pregnant females
- B. Infants and young children
- C. Neonates
- D. Elderly
- E. Adult males



Other Viruses causing gastroenteritis

1-Norwalkviruses



2-Astroviruses

3-Adenoviruses

Serotypes 40&41 cause infantile gastroenteritis

Structure:

A-Family : Calicivirus

B-Nucleocapsid :

- ss RNA ■ Icosahedral

C - Non enveloped

Pathogenesis & Clinical manifestations

A- Mode of transmission :

Ingestion of **contaminated sea food or water.**

B- Disease

Most important cause of **epidemic gastroenteritis in adults,**
specially on cruise ships.

**NOROVIRUS
(Norwalk virus)**

Epidemiology

- ✿ Faecal-oral route [water, shellfish]
- ✿ Outbreaks of GE in schools, camps & cruise
- ✿ All age gps

Clinical features

- ✿ Children → vomiting [projectile]
- ✿ Adults → diarrhea

Diagnosis

- ✿ Viral Ag in stool by ELISA

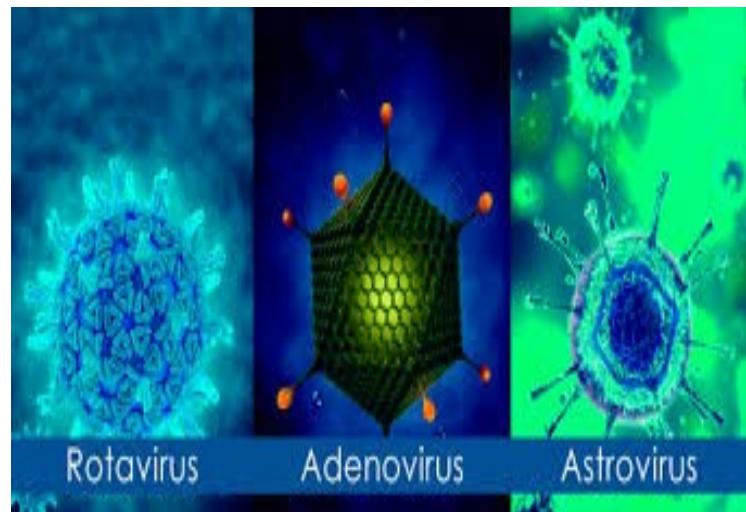
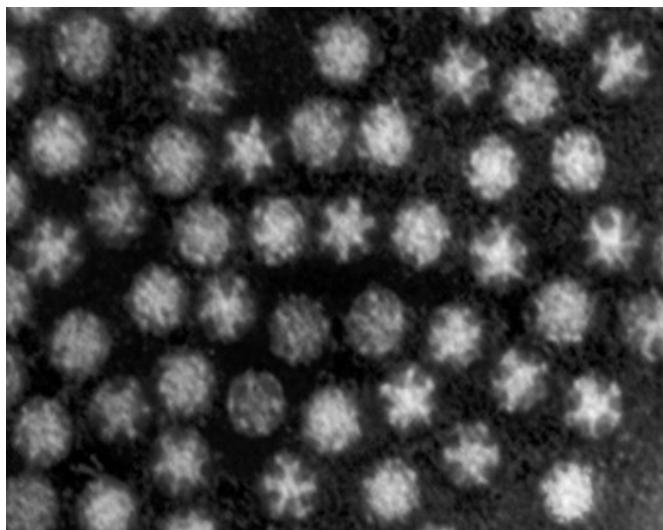
Astroviruses

Structure

A - Nucleocapsid

1 - ss-RNA

2 - Similar to a star in shape.



B - Non enveloped

Clinical manifestations

Produce a disease similar to Rota & Aden

in neonates , young children and

immunocompromised persons

Astroviruses

- Astroviruses are nonenveloped RNA viruses similar in size to polioviruses.
- They have a characteristic five- or six-pointed morphology.
- **These viruses cause watery diarrhea, especially in children.**
- Most adults have antibodies against astroviruses, suggesting that infection occurs commonly.
- No antiviral drugs or preventive measures are available.





SUGGESTED TEXTBOOKS

***-Review of Medical Microbiology and Immunology,
Warren Levinson Chapters 39 RNA enveloped viruses ,
Chapter 40 RNA nonenveloped viruses***